6.0 LAND USE

This section discusses land uses in WRIA 20 and the potential effects of these various land uses on water quality and quantity in the watershed. Often, the effect of a land use on water quality is determined by the management practices and policies in place and the current and historical land cover in the area. Also, historic land uses have a significant impact on the landscape and the surface process that occur today.

Land cover (what is physically covering the ground) in WRIA 20 provides the basis and context for this assessment. Land use (how that land cover is managed) is also discussed. Land use practices and related effects on water quality and quantity reported in studies that have been conducted in the watershed are presented, as well as a brief discussion of plans and policies affecting land use in WRIA 20. This Phase II land use assessment is intended to be used as a tool to develop and prioritize strategies for maintaining water quantity and quality in the WRIA 20 Management Plan, and also to understand the effects of land use on watershed hydrologic function.

6.1 Land Cover in WRIA 20

Land cover describes the status and type of vegetation and other ground cover on the land in an area. Land cover is the result of natural processes and vegetation combined with current and historical land use practices. Land cover is presented in this report to paint a picture of the current state of the watershed, and to indicate the general land cover types (trees, grasses, houses, etc.) that characterize the watershed. Although these data indicate the structure or vegetation that exists on the ground, they do not indicate the current or planned activities for an area, or how the area is being managed.

Land cover in WRIA 20 is illustrated in Figure 6-1. This land cover data set was obtained from the National Land Cover Database (NLCD) and is interpreted from 1992 LANDSAT Thematic Mapper satellite images with 30 meter resolution. Because of the scale of these satellite images, the land cover information presented here is effectively the average of the land cover per 30 square meter pixels across the watershed. Users accuracy for the data set is estimated to be between 57% and 93% for land use classes with overall average accuracy of 83%. This land cover information can be used to provide an understanding of overall land cover distribution in the watershed in 1992, but is not expected to be accurate at a small scale (i.e., land cover distribution within one mile of Forks).

Land cover from the NLCD is presented in nine categories. The transitional category contains areas with disturbed land cover, and can be used in the forest regions to indicate areas where the forest has been clearcut and not yet regrown to maturity. Selective logging practices are not likely to be apparent in the transitional land cover category. Developed land cover categories can include agriculture/orchards, transitional, and residential/commercial. Other land cover categories presented are forested uplands, water, barren, shrublands, and wetlands; these categories may or may not show effects of human land use. It should be noted that the “forested upland” classification provided by USGS designates lands that are elevated such that they are not wetlands.

Table 6-1 presents the number of acres in each land cover category by sub-basin and for the entire WRIA. Table 6-2 shows the percentage of each land cover category by sub-basin and by watershed (last column). “Pacific Sum” represents the land area contained in the five small sub-basins that drain directly to the Pacific Ocean.

According to the NLCD data, the majority of WRIA 20 (88%) and of most sub-basins (81%-93%) is forested upland. Because such a large proportion of the watershed is forested, the land uses in forested areas will be the focus of this land use discussion. The transitional land cover class illustrates that the highest proportion of clearcuts are likely found in the Dickey (12.6% of sub-basin, or 8,544 acres), Pacific Sum (8.5% of sub-basin or 6,341 acres), Hoh (5.1% of sub-basin, or 9,740 acres), and Sol Duc (4.9% of sub-basin or 7,247 acres) sub-basins.

Other developed land covers throughout the watershed make up a very nominal percentage of the entire watershed. According to the NLCD data, residential/commercial and agriculture/orchards together make up less than 1% of WRIA 20, or less than 4,000 acres. Local non-point sources related to these land covers are not expected to have a large scale impact on the watershed as a whole. This report does not address local point source water quality issues that may be associated with these land covers.

6.2 Land Use in WRIA 20

General land use in WRIA 20, as classified by Clallam and Jefferson County Comprehensive Plan zoning, is illustrated in Figure 6-2. In WRIA 20, land cover is very strongly dominated by forest lands, which are utilized for a variety of purposes including, predominantly, national park (35% of watershed) (conservation), national forest (17% of watershed) (forest agriculture and conservation), and state and private forest lands (40% of watershed) (forest agriculture and conservation). Percentages of land represented by these land ***uses*** are not necessarily equivalent to the percentages of land within the NLCD upland forest land ***cover*** classification because other land cover types (eg., water, barren, transitional, and grasses) are also included within the land use category. Conversely, low density residential areas may be classified in the NLCD dataset as having upland forest land cover if trees are predominant.

Much of WRIA 20 is made up of publicly owned lands, managed by the Washington Department of Natural Resources (WDNR), the US Forest Service (USFS), and the National Park Service (NPS). Public lands in WRIA 20 are illustrated in Figure 6-3.

6.3 Effects of Land Use on Water Resources

Watershed hydrology can be modified by land cover changes in the watershed, such as land clearing, agriculture, urbanization, or construction of infrastructure. Anthropogenic land cover changes due to different land uses can also increase or decrease the rate at which surface geomorphologic and hydrologic processes take place or change the impact of the forces of these processes relative to each other.

Watershed hydrology is driven by the way that precipitation, surface water, and groundwater move through the watershed system. Water generally enters the system as precipitation, which may then be infiltrated to the soil, intercepted by vegetation, evaporated, or moved across the landscape as surface runoff. Watershed land cover drives the percentage of water that moves through the landscape in each of these processes. In areas with dense vegetation, more water is intercepted or infiltrated than moves across the surface as runoff. In areas with less vegetation, a higher percentage of the water becomes surface runoff. The change in hydrologic regime due to land cover change has repercussions in the geometric shape of the stream channel, instantaneous rate of flow, the annual hydrograph, and the stream ecosystem itself.

The effects of land use on water quality and quantity in WRIA 20 have been discussed in assessments conducted by the Washington State Conservation Commission, USFS, WDNR, and other agencies. These effects are discussed in the following sections.

6.3.1 Overall Watershed

The WRIA 20 Limiting Factors Analysis (LFA) discusses general habitat problems for salmonids in WRIA 20 (Smith, 2000). The habitat problems cited in the LFA can provide insight into land use impacts that have historically or are currently occurring in the watershed, as the same factors that create salmonid habitat problems are also likely to impact water quality, and may also affect water quantity. The LFA represents a snapshot in time, and was published before many assessments were completed. Assessments that were completed subsequent to the LFA have been recognized in ranking projects.

General changes to the natural system are outlined below, along with factors that limit salmonids, and are summarized by sub-basin:

Ozette – Lack of large woody debris, invasive plants, sediment (no cause cited), incised banks and reed canary grass, general poor large woody debris and riparian habitat, also warm waters, altered estuary from dredging and diking, and poor hydrologic maturity.

Quillayute Estuary – Dredged and diked estuary, increased sediment, and increased flow problems. A four-year assessment of this watershed was initiated in 2000, therefore the results of that assessment were not reported in the LFA.

Dickey – Sediment from roads, riparian windthrow at logging buffers, warm water, culverts, low flows made worse by loss of fog drip, large woody debris reduced due to flooding, riparian roads are problems in isolated areas.

Sol Duc – This sub-watershed is in good condition inside the Olympic National Park. Outside the Park, sedimentation is a problem from landslides and roads, inadequate amounts of large woody debris, wetland habitat reduction, warm water, overallocation has created low flows, and some creeks suffer from blockages.

Bogachiel – This sub-watershed is in excellent condition inside the Park. Outside the Park, problems include fish passage issues, loss of riparian area, lack of large woody debris, and collapsed banks.

Calawah – Landslides from roads and sedimentation are the two main problems in this sub-basin. Other problems are dewatering, channel instability, riparian roads, lack of large woody debris, and warm water.

Hoh – This sub-watershed is in excellent condition inside the Park. Outside the Park, problems are debris flows that lead to streambank scour, incision, high sediment loads from mass wasting and road erosion, loss of important floodplain complexes, riparian roads, and loss of fog drip.

Smaller independent streams – Limited data are available but sedimentation and riparian area development are a general problem.

6.3.2 Forest Lands

The vast majority of land in WRIA 20 is made up of either managed or preserved forest lands under federal, state, or private management. Overall, the forest lands in WRIA 20 experienced a period of widespread forest harvest from about the 1940s to the 1980s. Widespread timber harvest was reduced significantly after 1994 with the adoption of the Northwest Forest Plan. Timber harvest data reported in the Washington Timber Harvest Report (WDNR, 2002) detail the quantity of timber harvested per County in Washington State. These data are not available per WRIA, but can be used to estimate the amount of timber being harvested in the area of WRIA 20. Figures 6-4 and 6-5 present annual timber harvests between 1965 and 2002 in Clallam and Jefferson County by land ownership. Land ownership types are defined as the following:

- Tribal – Tribal and allotted lands held in trust by the federal government;
- Forest Industry – Companies and individuals operating wood-using plants;
- Private Large – Non-industrial companies and individuals not operating wood-using plants but with statewide holdings totaling 1,000 or more acres;
- Private Small – Non-industrial companies and individuals not operating wood-using plants and having statewide holdings totaling less than 1,000 acres;
- State – State owned lands managed by the Department of Natural Resources and the Parks and Recreation Commission for a variety of trust beneficiaries; and
- National Forest – Lands managed by the USDA – Forest Service.

It is important to note the different scale of the Y-axis on the two graphs; significantly more timber is harvested in Jefferson County than Clallam. In both Counties, timber harvest on Federal lands was reduced significantly in the early 1990s with the implementation of the Northwest Forest Plan. In Jefferson County, harvest on lands other than federal was reduced in the early 1990s as well. In Clallam County, harvest on private and state lands does not show the same pattern of reduction that it does in Jefferson County.

The Northwest Forest Plan and the Forest and Fish Rules contain many provisions for protecting water quality; many of the practices discussed in this section that are damaging to water quality and quantity are no longer allowed or have been significantly curtailed. Forest practice rules have been modified as recently as 2001. The effects of this most recent management approach, once it is fully implemented, should result in improved water quality. Land clearing and road building on steep slopes during the years of widespread timber harvest in the watershed provoked a host of environmental problems including landslides and sedimentation. When conducted adjacent to streams, these activities reduced large woody debris input, increased sediment input, and allowed more sunlight to enter the stream, increasing stream temperature. Although forest harvest in the watershed has slowed significantly, and new forest practice rules are in effect that are likely to reduce the impacts to the watershed system, the watershed continues to exhibit symptoms of the historic forest practices. The overall improvements resulting from recent rule changes are not expected to be reflected in measurements of water quality and watershed function for some time.

Effects of land use practices on water quantity and quality specifically in forested areas are discussed in watershed assessments and analyses completed by the State Department of Natural Resources, the USGS, the USFS, and the Hoh, Makah, and Quileute Tribes. Generally, land use activities in forested areas that affect water quantity and quality are harvest (particularly clearcut harvest), land clearing in

the rain-on-snow zone, riparian development and clearing, road building, and, to a lesser extent in WRIA 20, pavement and urbanization.

It is important to note that the following effects of forest practices are the repercussions seen in the watershed today from past road building, harvest, and management practices. After or at the time that the data for the reports cited below were written, rules and policies were put into effect that significantly changed the way forest land is managed in WRIA 20. These are the 1994 Northwest Forest Plan, the 1997 Forest Practice Act, the 2001 changes to the Forest Practice Rules, and WDNR's 1997 Habitat Conservation Plan. These rules and policies are discussed in more detail in Section 8.

Clearcut Harvest

In a landscape devoid of vegetation, the rate of surface runoff is greater than in a forested landscape. Higher rates of surface runoff increase the erosion capability of water as it moves across the land surface, and yields more water in the stream at any one time, making streamflows "flashy." These flashier flows result in more water in the stream channel that moves faster, increasing the scouring capability of streams. Flashier flows also result in less time and capacity for streams and floodplains to dissipate high intensity flows, increasing the frequency of high magnitude floods. Land clearing can also yield other problems including increased sedimentation, and reduction of the filtering ability from the landscape that would improve water quality.

In a discussion of the effects of land clearing on watershed hydrology, the Department of Natural Resources' Habitat Conservation Plan (WDNR HCP, 1997) states that, "through the process of evapotranspiration, plants move water from the ground to the atmosphere. Evapotranspiration affects water table and soil moisture levels, and consequently timber harvest in and around a wetland can affect the hydrologic regime of the wetland. The principal organs of evapotranspiration are leaves, and a minimum [quantity of] leaf area per acre is necessary to maintain the hydrologic regime of a forested wetland."

Watershed Analyses were conducted in the East/West Dickey, South Fork Calawah, North Fork Calawah, and the Sol Duc watersheds (Rayonier, 1998; USFS, 1998; USFS, 1996; and USFS, 1995). The watershed analysis of the Sol Duc sub-basin (USFS, 1995) found that effects of historical clearcut harvest practices include increased landslide frequency, more rapid runoff, higher stream peak flows, and greater stream erosion. Additionally, the practice of burning logging slash and understory vegetation further reduced the forest's ability to resist against debris flows, snow avalanches, and other mass wasting events.

The Salmon River watershed is located in the drainage network just south of WRIA 20. The USGS completed a qualitative assessment of the manipulation of vegetation and how this might affect changes in hydrologic response in this watershed (Bidlake, 2003). Among other things, this assessment looked at how forest harvesting and road construction have altered frequency and magnitude of peak and low flows. This assessment was primarily a literature review where the USGS provided examples of documented effects of harvest on water quality and quantity in the Pacific Northwest.

The literature review reported that water yield (unit area discharge from a given catchment) increases after extensive harvest of dense forests. This effect is attributed to reduction in evapotranspiration. Generally, this increased water yield decreases through the decade following harvest, and recovery is attributed to vegetative regrowth. The removal of trees may also reduce water yield by reducing the amount of water available as fog drip. Overall, the literature reviewed as a part of the Salmon River

Watershed Assessment found that peak flow effects from timber harvest are difficult to interpret, as the effects depend on the variations in composition of the pre-harvest forces, as well as the extent and type of harvest, roads, and local soils, geology, and climate.

The 2001 Forest Practice Rules do not prevent clearcut harvest, but do impart significant constraints on the way that forest harvest is conducted. The current, more protective harvest practices have not been in effect long enough to evaluate long term changes to watershed-wide processes.

Land Clearing in the Rain-on-Snow Zone

The rain-on-snow zone is defined by WDNR as an area (usually an elevation zone) where it is commonplace for snowpack to be partially or completely melted during rainstorms several times during the winter. In the Olympics, this area ranges from approximately 1,700 to 2,600 feet in elevation. The problem of increased runoff and increased peak flows associated with land clearing is exacerbated in the rain-on-snow zone. "In forest openings, the amount of snow that accumulates and the turbulent-energy exchange between the air and the snowpack surface are greater than in forest stands" (Berris & Harr, 1987). "The greater accumulation of snow available for melt and the greater turbulent-energy exchange to melt snow may increase the amount of water available for runoff during rain-on-snow events in forest openings and worsen downstream flooding and erosion by increasing peak flows. These openings may result from wildfire, insect attack, blowdown, and timber harvest. Of these, timber harvest is the only process that can be planned to help mitigate the potential effects of increased water available for runoff during rain on snow events.

In Oregon and Washington, much of the timber harvest occurs at mid-altitudes of the western Cascade Range in the transient-snow zone" (Van Heeswijk, et al, 1996). "Additional snow accumulation and more rapid melt in young forest stands can increase the depth, velocity, and erosive power of streamflow during rain-on-snow events." (USFS, 1995, Sol Duc Watershed Analysis) Section D - Riparian conservation strategy for the Five west-side planning units, of the WDNR HCP (1997) states that, "A sub-basin in western Washington that is completely within the significant rain-on-snow zone is estimated to yield an additional inch of water during a 10-year 24-hour rain-on-snow event if one-third of the sub-basin is in an immature condition."

Riparian Development and Clearing

Riparian areas are the stretches of land area that are the margin between land and freshwater. They are the location where terrestrial ecosystems and watershed land uses meet and affect the stream ecosystem. Riparian areas serve many functions important to the watershed as a whole. Plants and moist soil filter nutrients, sediment, and toxins from runoff before they reach the stream channel (Manci, 1989). Root structures and ground cover decrease stream bank erosion and stream sediment load. Canopy cover shades streams and reduces water temperature, which is particularly vital for salmon. Streamside vegetation increases roughness, dissipating flood water velocity. Deep rooted trees increase ground porosity and capillarity, and improve infiltration (Tabacchi et. al, 2000). Riparian plants provide organic inputs (including large woody debris) to the stream which creates habitat, stores sediment and organic matter, and adds habitat complexity to the stream channel.

Riparian areas are often cleared to make way for human land uses, and benefits to the entire watershed system are lost. Any land clearing or land conversion activity including logging, agriculture, residential development, and general urbanization can result in riparian area degradation if the area is not protected from clearing and subsequent development.

In WRIA 20, impacts of land use on riparian areas were assessed in the Sol Duc Watershed Analysis (USFS, 1995), the South Fork Calawah and Sitkum Watershed Assessment (USFS, 1998), and the East and West Dickey Watershed Assessment (Rayonier, 1998). In the Sol Duc sub-basin, "both LWD [large woody debris] recruitment and shade situations are a result of past land clearing and logging and on-going land use for agricultural and urban purposes which have either eliminated trees or left fewer and smaller trees for LWD recruitment and stream shading in riparian areas." (USFS, 1995, Sol Duc Watershed Analysis). In the South Fork Calawah and Sitkum sub-basin, "As a result of past timber harvest, fire, broadcast burning, slash cleanout, and selective removal of conifers from riparian areas since the 1940s; the riparian area forest species, diversity, abundance, and size have been reduced." LWD has been reduced in the East/West Dickey sub-basin from 1950s logging practices that did not protect stream channels (East/West Dickey Watershed Assessment, Rayonier, 1998).

The 2001 Forest Practice Rules contain a riparian buffer strategy which creates 90-200 foot buffer zones beside fish-bearing streams. The intention of these buffers is to provide shade to streams at levels that approach or exceed the amounts provided by mature conditions (WFPA, 2003). Additionally, the Forest Practice Rules riparian buffer strategy promotes retention of mature trees alongside streams to allow for LWD input and provides incentives to landowners who voluntarily place LWD in streams (WFPA, 2003). These and other recent changes in the way the forest is managed are expected to significantly improve the problems cited in the watershed analyses.

Road Building

Roads built in certain areas can pose water quality risks. Often, roads are built along streams because topographically road construction is easier in these flatter areas. Impacts to the stream channel from roads can range from no-impacts to potentially significant impacts. When roads are not paved, fine grained sediments may wash off roads and into the stream, impacting habitat resources. Additionally, roads alongside streams can affect channel conditions by potentially limiting the ability for the channel to move. For example, if the channel were restricted along a particular reach by a road (or other corresponding structures like riprap, revetments, bridges, culverts, etc.) on one or both sides of the stream, the channel may respond by changing course and/or changing geomorphologic parameters such as sinuosity, width/depth ratio, bank-full condition, etc., resulting in downstream impact and changes in channel conditions.

Additionally, forest roads in the watershed can be related to mass wasting events. The Sitkum and Calawah (USFS, 1998) and Sol Duc (USFS, 1995) Watershed Assessments both found forest road network development and timber harvest contributed to increased frequency and magnitude of peak flows. These roads also contribute to landslides and occasionally cause large debris flows. Roads that cross the same stream channel two or more times are particularly prone to causing these problems. The North Fork Calawah Watershed Assessment (USFS, 1996) found that, "The trend of sediment production has been decreasing since the 1960s, dramatically so since the 1980s, but is unlikely to decrease further without focused road maintenance efforts." Road building is one of the major sources of fine sediment in the Dickey sub-basin. Erosion from roads is a problem throughout the Dickey sub-basin, exacerbated by road surfacing material and the local high precipitation levels (Smith, 2000).

Forest Practice Rules require that "all existing forest roads be improved and maintained to provide fish passage to fish in all life stages, prevent landslides, and limit delivery of sediment and surface runoff water to streams and avoid capture or redirection of surface or ground water" (WFPA, 2003). To accomplish these goals, landowners have been given deadlines before which their roads must be maintained or repaired. However, Veldhuisen and Russell (1999) concluded that, "Present Forest

Practice Rules, designed as they were to prevent erosion within the roadway, were generally found to be ineffective at preventing erosion below drainage sites along monitored roads".

6.3.3 Pavement/Urbanization

When precipitation falls on paved areas it is generally forced to move through the landscape as runoff. In areas with high levels of urbanization, this can result in problems of increased flood flashiness and scour of the stream channel similar to those seen in clearcut areas. The specific effects of urbanization on a landscape depend on a number of variables including topography, soil type, and other vegetative cover. As there is a minimal amount of paved or urbanized land area in WRIA 20, current water quality or quantity effects are not expected at a watershed scale, although there may be some localized impacts.

6.4 Forest Land Management in WRIA 20

Land in forested areas in WRIA 20 is primarily managed by the National Park Service, National Forest Service, the Washington Department of Natural Resources, and private land owners. Land managed by public entities is shown in Figure 6-3.

6.4.1 Olympic National Park

Thirty-five percent of WRIA 20 watershed is in National Park management. This land is managed for conservation, and is expected to undergo hydrologic processes in a manner very similar to a pristine environment. The fact that this land area is in the headwaters of the watershed is particularly beneficial to water quality because this helps to ensure that water quality and quantity in these sensitive areas of the watershed is in near pristine conditions.

6.4.2 Olympic National Forest Lands

Seventeen percent of the WRIA 20 watershed is in National Forest management by USDA – Forest Service. These lands are managed according to the Northwest Forest Plan. Land uses are designated through a zoning system specified in the Northwest Forest Plan, and are illustrated in Figure 6-6. The land use categories are as follows:

- Timber Management Areas (72.7%)
- Private land within forest boundary (21.5%)
- River Corridor (general) 1-4 (3.9%)
- Visual Management Area (0.9%)
- Botanical Areas, Bald Eagle Management Areas (0.9%)
- Developed Recreation and Administration (0.09%)

Timber harvest may occur in portions of the Timber Management Areas designated as Adaptive Management Areas, however, widespread harvest has not occurred in WRIA 20 on National Forest lands since the 1994 adoption of the Northwest Forest Plan, as was illustrated in Figures 6-4 and 6-5. Any harvest conducted in these adaptive management areas is implemented using an adaptive management approach of development and testing of harvest methods which meet ecological, economic, and social objectives. This approach has significantly limited timber lands available for harvest. Typically, harvest under the Northwest Forest Plan is conducted on lands designated as "Matrix." No lands within the Olympic National Forest have been given this designation.

The age of tree stands in the National Forest gives some indication of the amount of time that has passed since the area was last harvested. Generally, older tree age classes provide better canopy cover, tree species diversity, and more consistent beneficial water quality and quantity effects. GIS data were obtained from the Forest Service that depicts the age class of trees in the Olympic National Forest. These data are illustrated in Figure 6-7.

6.4.3 State and Private Commercial Forestry

Many state and private forest lands in WRIA 20 are managed for commercial forestry. Management on these lands is directed by the State Forest Practice Rules, written according to the direction of the Forest and Fish Report. Forest Practice Rules impose many constraints on forest practices including best management practices (BMPs) for road construction and maintenance, restoration and maintenance of riparian habitat, and restriction of harvest in sensitive areas. These are intended to minimize the effects of roads and road failure on water and fish habitat quality. These rules were updated in 2001 by the Forest Practice Board to further improve standards and guidelines for riparian buffers and forest road maintenance. The Forest Practice Rules provide provisions for monitoring the rate of timber harvest, but they do not impose significant limitations on harvest rate. These rules have only been in effect a relatively short time, and the effects of the revised management strategies have not been fully realized, however it is expected that harvest under the current regulations will have less impact on water quality and quantity than those activities that were conducted before the Forest and Fish Act.

The Forest Practice Rules also contain regulatory mechanisms for mitigation of past practices, including guidelines for Road Maintenance and Abandonment Plan implementation that set deadlines for corrections of problem roads (WAC 222-24). The goals for road maintenance establish that all forest roads must be maintained to prevent potential or actual damage to public resources. Fish passage must be addressed by December 2016. Replacement will not be required for existing culverts functioning with little risk to public resources or for culverts that were installed under an approved forest practices application or notification, and are capable of passing fish, until the end of the culvert's functional life. Corrective, rather than reactive, provisions such as these are working to correct legacy impacts from past forest practices.

A multi-species Habitat Conservation Plan (HCP) is implemented along with the Forest Practice Rules on State lands. The HCP is intended to fulfill Endangered Species Act (ESA) requirements for forest practices on state lands for a number of endangered and threatened species. The HCP generally requires more stringent environmental protection constraints than the Forest Practice Rules. The HCP has a Riparian Conservation Strategy which limits road building in riparian areas, and harvest in riparian areas, on unstable slopes (which are often adjacent to streams), in rain-on-snow zones, and in wetlands. Additional procedures are defined for preventing road failure and erosion. The HCP generally has more stringent buffer requirements for state lands than the Forest Practice Rules set forth for private lands.

6.5 Management of Non-Forest Lands in WRIA 20

This section discusses land uses outside of national and state forests in WRIA 20.

6.5.1 Clallam and Jefferson County Zoning Designations

Land use within WRIA 20 as designated by Clallam and Jefferson County zoning is illustrated in Figure 6-2. County Land Use is determined through comprehensive planning that takes into account the protections of some areas through the Growth Management Act and the Shoreline Management

Act. Acreages in each land use category are shown in Table 6-3 for Jefferson County and Table 6-4 for Clallam County. The vast majority of the County land is in forest land uses. Other significant land uses are National Park and low density residential. As discussed above, land uses other than those that are forestry related do not make up a significant portion of the watershed and therefore are not expected to have watershed-wide effects on water quality and quantity. Localized impacts on water quality are possible particularly in the local drainage area of land uses including agricultural, residential, commercial, and other more intensive human uses. Some sensitive areas within these land uses, such as riparian areas, are protected through the County's Critical Areas Ordinance (Clallam County Code Section 27.12, and Jefferson County Unified Development Code Section 3.6.4). The potential for significant future residential and commercial growth in the watershed is generally limited to Urban Growth Areas defined in Comprehensive Plans. The City of Forks Urban Growth Area is the only one in the WRIA.

Agriculture

USDA Agricultural Census data were consulted for this report for a summary of agricultural practices in the watershed. The Agricultural Census reports agricultural use by County, not by watershed. According to the Agricultural Census, in Clallam and Jefferson Counties as a whole, 19,109 acres of land was in agricultural use in 2002. According to NLCD data, 2,362 acres within WRIA 20 had agricultural land cover in 1992. Because of the limited accuracy of the NLCD data at a small scale and the county-wide scale of the Agricultural Census these agricultural land cover and land use numbers are considered rough estimates. Land in these areas is managed under Clallam and Jefferson County governance.

6.6 Summary

Overall, the land in WRIA 20 is heavily forested with small areas of residential, agricultural, and commercial land uses. Forest land in WRIA 20 has been used for conservation, recreation, timber harvest, and other land uses. Generally, historic (prior to 1994) timber harvest and road building practices were conducted in a manner that was likely to increase the frequency of mass wasting events, increase in-stream sedimentation, and generally decrease water quality in the watershed. However, since that time, timber harvest has been reduced significantly on federal lands in the watershed and on all lands in Clallam County. Most timber harvest in the watershed is currently occurring on State and private lands and is subject to the 2001 Forest Practice Rules as mandated by the Forest Practices Act. Harvest conducted on State lands is also subject to the WDNR Habitat Conservation Plan (1997). Timber harvest conducted under these practices is anticipated to improve water quality and have less overall impact on watershed hydrologic processes. However, it is too soon to realize the full outcome of these new practices. Intensive land use in specific areas (such as agriculture or residential) and point source water quality threats from industrial and other discharges were not assessed in this technical assessment of land use impacts in WRIA 20, and effects on local water quality and quantity are unknown at this time.